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DIVIDING LAND.

BY PROF. L. G. BARBOUR, RICHMOND, KENTUCKY.

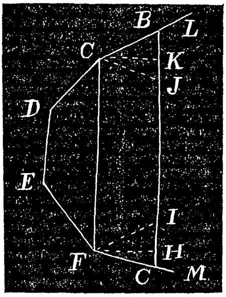
THE following method is so obvious that it must be in some of the text books, though I have not met with it. The need of it has arisen in actual practice.

The area *CDEF* lacks (say) 20 acres of the required amount. Find the bearing and distance of *FC*. Since *CL* and *FM* are boundary lines, their bearings and distances are known. We desire now to get the length of *CK* or its equal *FH*, perpendicular to *CF*, so that *BCFG* shall be 20 acres and *BG* parallel to *CF*. Angle $BCK = BCF - 90°$, and $GFH = CFG - 90°$.

Let $CK = FH = x$; $\tan BCK = t$; $\tan GFH = t'$; $\therefore BK = tx$, $GH = t'x$, area $BCK = \frac{1}{2}x^2t$, area $GFH = \frac{1}{2}x^2t'$, area $BCFG = CF \times CK + \frac{1}{2}(t+t')x^2$.

Let $CF = d$; area $BCFG = A$; $\therefore (t+t')x^2 + 2dx = 2A$, whence

$$x = \frac{-d + \sqrt{[2A(t+t') + d^2]}}{t+t'}$$



CB and *FG* may diverge, as in the figure, or converge, as *CJ* and *FI*, or be parallel. If they converge, the algebraic sum of $t + t'$ will be negative, and we shall have

$$x = \frac{d - \sqrt{[-2A(t+t') + d^2]}}{t+t'}.$$

If *CB* and *FG* are parallel, $t + t' = 0$, and x is indeterminate. But in this case the added area is a parallelogram, $= CF \times CK = A$; from which *CK* is at once known.

In the 2nd equation, there is a limit to the value of A; for if $2A(t + t') > d^2$ the radical becomes imaginary. The maximum possible value of A is $d^2 \div 2(t+t')$. Then $x = d \div (t+t')$.

Example.—Let $d = 50$ chains $BCK = 5°$; $GFH = 6°$; $A = 20$ acres $= 200$ square chains; then is

$$x = \frac{-50 + \sqrt{[400(.08749 + .10510) + 2500]}}{.08749 + .10510} = 3.97 \text{ rods.}$$

Again, let the boundary lines converge, $t = .08749$, $t' = .10510$, $d = 50$ and $A = 200$ square chains, as before; then

$$x = \frac{50 - \sqrt{[-400(.08749 + .10510) + 2500]}}{.08749 + .10510} = 4.031 \text{ rods.}$$

Whence we find $BG = 50.76458$; $IJ = 49.2354$; $CB = x \div \sin BCK$.